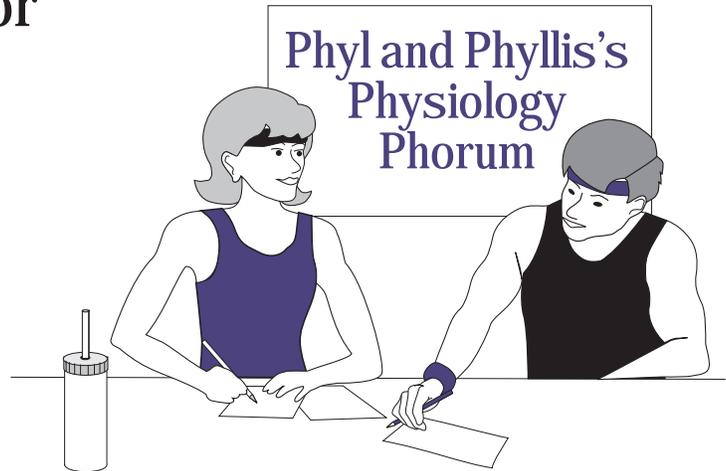


What are the factors that influence metabolic rate or the total daily energy expenditure (TDEE)?

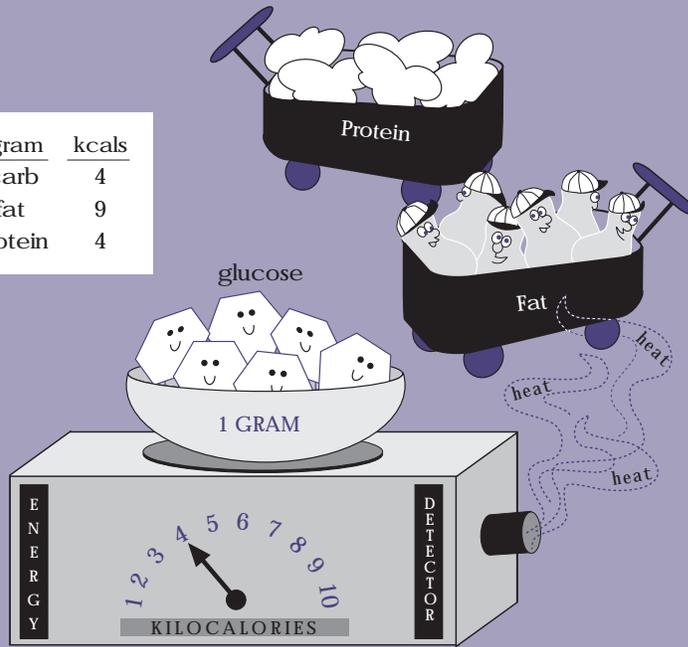


The energy used to make ATP to fuel the body's work comes from nutrients contained in the foods we eat. The amount of energy available in nutrients is expressed in kilocalories, though we commonly refer to them simply as calories. One gram of carbohydrate or protein yields four calories. One gram of fat yields more than twice that, or nine calories. The rate at which the body's tissue cells use the calories to perform all of their work during the course of a day is called metabolic rate, also known as the total daily energy expenditure (TDEE).

There are three primary factors that influence the TDEE. These include: the resting metabolic rate (RMR), or the rate of energy expenditure that maintains basic life processes in the absence of activity; the thermic effect of food (TEF), which is the energy required to process foods; and activity, the energy required to fuel the body's physical work.

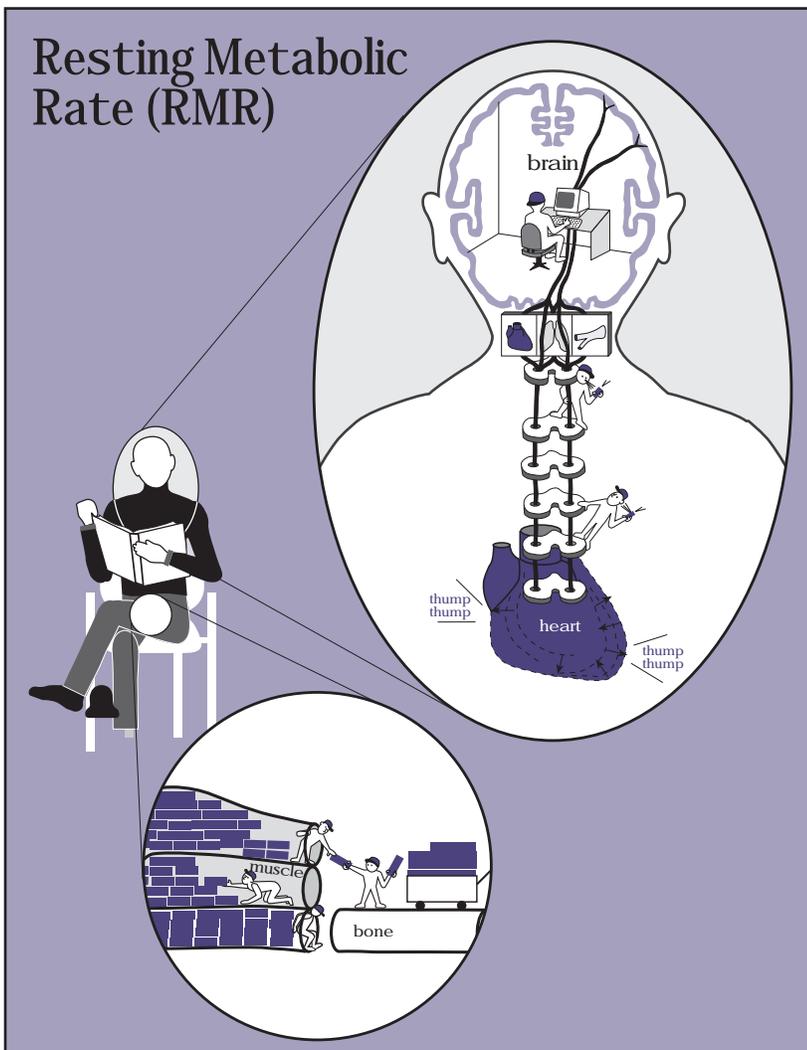
Kilocalories in Nutrients

1gram	kcal
carb	4
fat	9
protein	4



Even without physical activity, all of our metabolically active tissues require energy to function. During the course of a normal day, cells function like tiny factories. They build, break down and rebuild, package, secrete, and transport materials in and out. All of these processes require energy expenditure. Such energy expenditure is called the resting metabolic rate. RMR may be influenced by several interacting factors. These factors include an individual's body and frame size, body composition, (proportion of fat-free or muscle mass to fat mass), age, growth, gender, genetic predisposition, hormonal and nervous control, environmental temperature, illness, and medications.

Resting Metabolic Rate (RMR)



Processing the nutrients in the foods we eat costs energy. Such energy expenditure is called the thermic effect of food. Foods are chewed, swallowed, and broken down through digestive processes. They are absorbed into the bloodstream and then transported to cells where they are used immediately or stored for later use. An individual may use ten percent of his or her total calorie intake to perform these processes. This means that for two thousand calories eaten during the course of a day, two hundred of those calories may account for the TEF.

Calorie Expenditures per hour of Common Activities*

ACTIVITY	CALORIES
Sitting quietly	84
Sitting and writing.....	114
Bicycling (5 mph)	174
Pacing (2 mph).....	198
Dancing (ballroom)	210
Light housework.....	246
Volleyball.....	264
Swimming (20 yds/min).....	288
Golf (carrying clubs)	324
Rollerblading/ice skating (9 mph).....	384
Scrubbing floors.....	440
Basketball (recreational)	450
Tennis (singles, recreational)	450
Swimming (crawl, 45 yds/min)	522
Aerobic dancing.....	546
Bicycling (13 mph)	612
Jogging (6 mph/10 minute mile).....	654
Cross-country skiing (5 mph).....	690

*Based on an individual who weighs 150 pounds or 68 kilograms

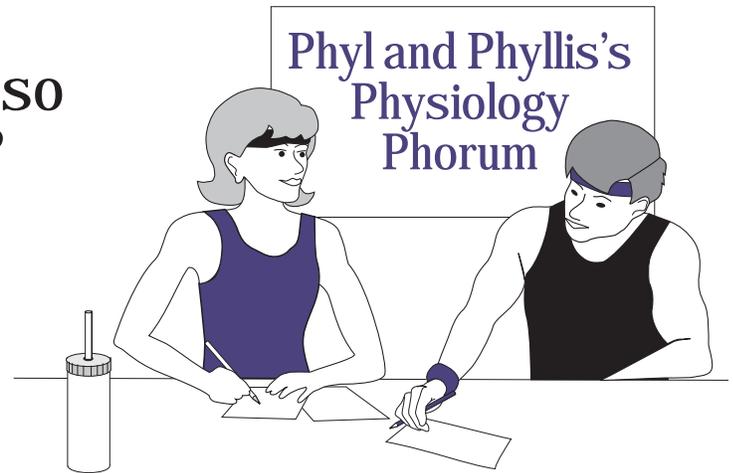
Daily physical activity level is the most controllable and significant factor in influencing metabolic rate or the total daily energy expenditure. Every cellular activity performed by the body costs energy. Physical activity costs a great deal more than sitting. For example, while you sit and read this book, you may use approximately one and a half calories per minute.

Yet, if you got up every hour and paced for five minutes, during that time, you could use three calories per minute. This notion is one to consider during the course of a busy day. A telephone conversation need not require that we sit, but in fact can be used to accomplish a mile of pacing during three calls lasting seven to nine minutes.

What is body composition?

How is it related to metabolic rate? Why is it so important to measure it?

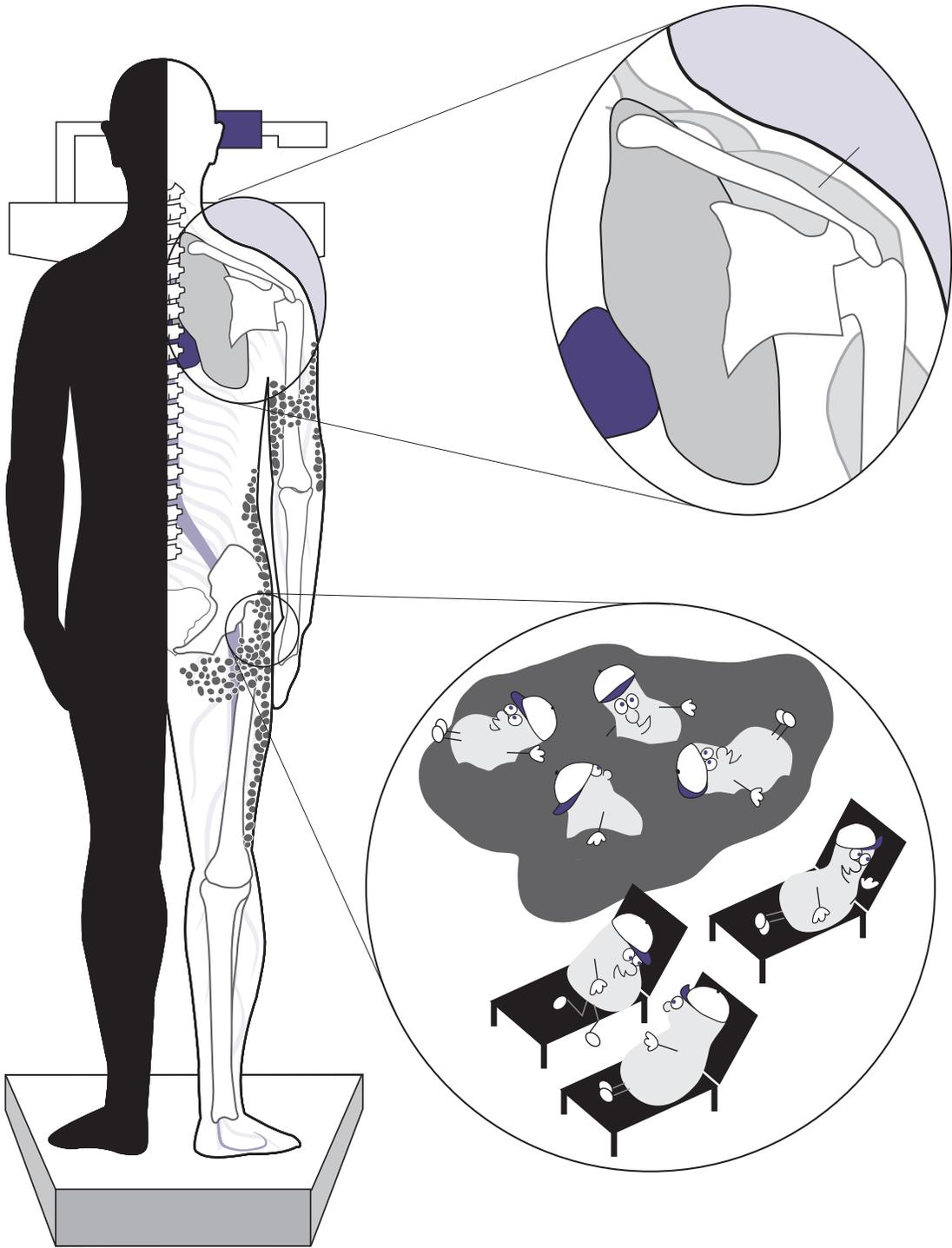
How is it measured?



When we step onto a scale and see a number in pounds or kilograms, we do not see a calculation that tells us the composition of that body weight: the proportion of fat-free mass (FFM) to fat mass. Body composition describes this proportion and is a more accurate assessment of health than body weight. A high proportion of FFM and a healthy body fat percentage typically translate to a lower risk of cardiovascular and other diseases.

FFM includes organs, muscle tissue, nervous tissue, bones, blood components, connective tissues, and glands. All of these tissues are metabolically active. Though it has some important functions in the body, fat is not considered to be metabolically active. Metabolic rate is directly related to the quantity of FFM in an individual's body; the greater the FFM, the higher the metabolic rate.

Body Composition



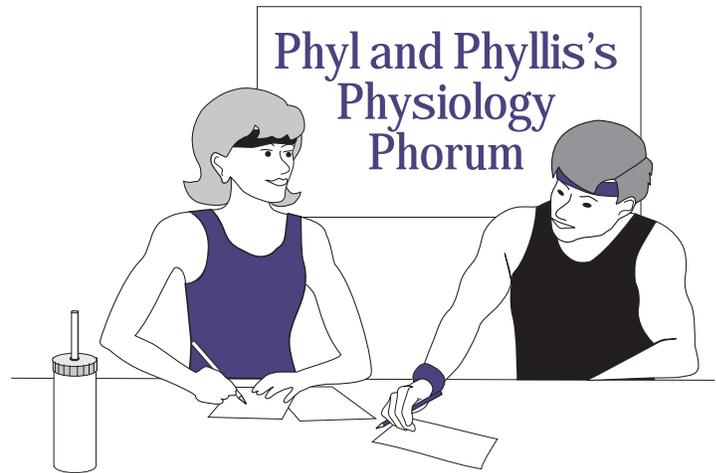
Due to the fact that body composition is a more accurate assessment of health than body weight, it is useful to measure the percentage of body fat. Attaining an exact measurement of body fat can be inconsistent and difficult. Traditionally, underwater weighing has been one of the most accurate methods of measuring body composition and body fat percentage. Underwater weighing estimates the density of the body tissues by weighing an individual on a special scale under water.

Today, this method is rarely available and has been replaced by another technique called Dual Energy X-Ray Absorptiometry (DEXA). Currently the “gold standard” method of measuring body composition, DEXA was originally used to measure bone mineral density. DEXA uses low energy x-rays and the known densities of fat, muscle, bone, and water to analyze the distribution and quantity of each throughout the body. Because abdominal obesity has been associated with the risk of the development of cardiovascular diseases and type 2 diabetes, it is useful to know body fat distribution as well as body fat percentage. DEXA can be costly, however, and it is typically only available in laboratory settings. Thus, other more affordable and accessible methods of measuring body composition may be utilized.

Bioelectrical impedance analysis (BIA), skinfold calipers, or anthropomorphic measurements, among other methods, may be used to estimate body composition. Bioelectrical impedance analysis (BIA) is an accurate, accessible, and painless method of estimating body fat percentage. In BIA, an individual is weighed; then height, age, gender, weight, and other information are entered into the computer of a BIA instrument. A small electrical current is then sent throughout the body and the resistance or impedance to it is measured.

Fat-free mass, much of which is muscle mass, contains a high proportion of water or fluid. Therefore, it imposes less resistance to the electrical current. Fat mass is composed of little water. Therefore, it presents greater impedance to the current. Body fat percentage is calculated by the BIA instrument based on the resistance or impedance a given body imposes on the circulating electrical current.

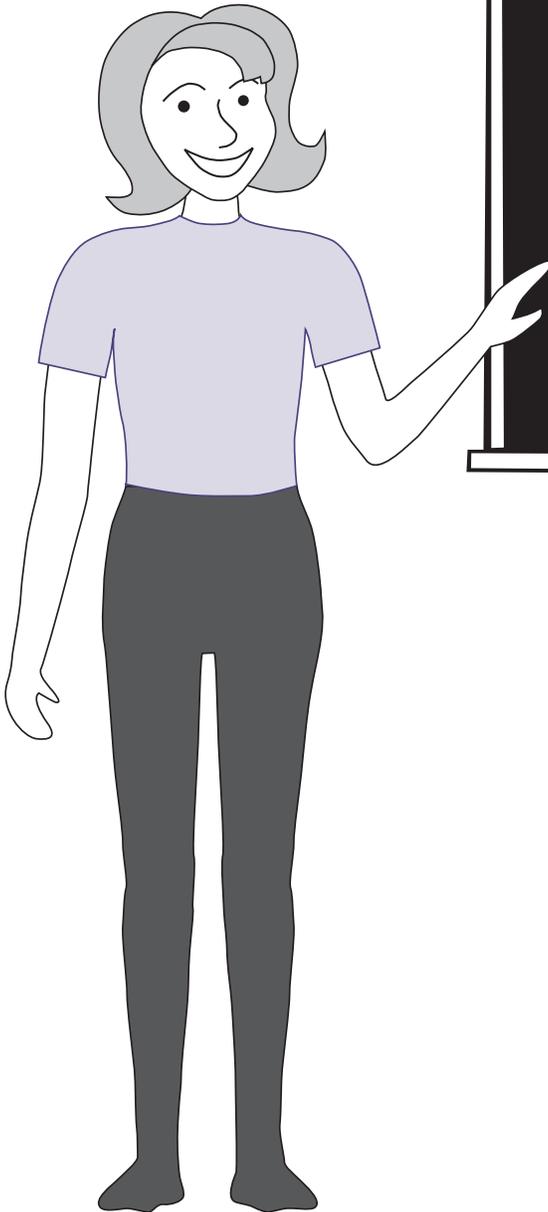
Another tool that is used to estimate body fat percentage is a skinfold caliper. The skinfold caliper measures pinches of skin with their underlying fat at designated sites. The sum of the measurements corresponds on a chart to an estimated body fat percentage.



Anthropomorphic measurements estimate body composition by using a tape measure to measure designated sites. The measurements are placed in special equations. The result of the equation corresponds to an estimate of body fat percentage. One of the most simple and useful anthropomorphic measurements is that of waist circumference. Waist circumference of greater than 40 inches, or 102 cm, in men and 35 inches, or 88 cm, in women is considered a significant clinical indicator of metabolic disease and is associated with a high risk for the development of cardiovascular disease and type 2 diabetes.

Desirable body fat percentages depend on individual goals. For better performance, male athletes may desire five to seven percent body fat while female athletes are frequently estimated to be in the range of 12 to 15 percent. Eighteen percent to 23 percent body fat for adult women and 12 percent to 20 percent for adult men is considered optimal. Body fat in excess of 25 percent in men and 30 percent in women is considered over-fat. The term “over-fat” is used rather than overweight or obese because an apparently normal weight individual may possess an unhealthy body composition; a body with too little muscle and too much fat.

Body Mass Index (BMI)



1) 150 pounds \div 2.2 = 68 kg
2) 70 in \times 2.54 = 177.8 cm
3) 177.8 cm \div 100 = 1.77 m

$$\frac{\text{Wt (kg)}}{\text{Ht (m)}^2} = \text{BMI}$$
$$\frac{68}{(1.77)^2} = 21.7$$

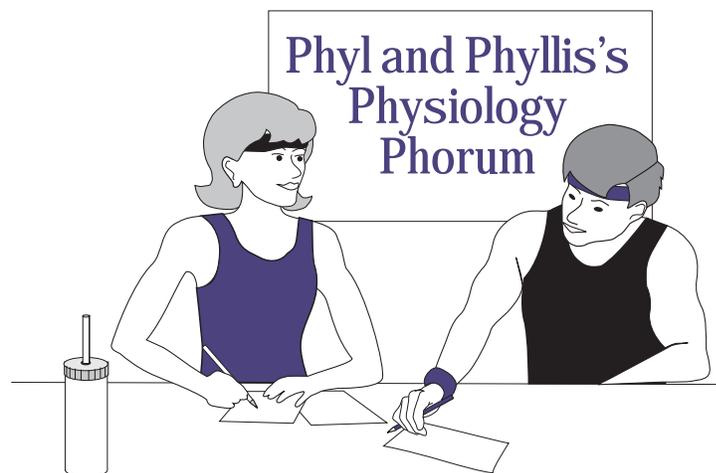
A calculation known as body mass index (BMI) is commonly used to determine obesity and the associated risks for disease. BMI uses only body weight and height and does not factor in body composition. The calculation is made by dividing the body weight in kilograms by the height in meters squared. Numbers ranging from 18.5 to 24.9 are considered healthy and normal. Numbers ranging from 25 to 29.9 correspond to moderately overweight. Numbers greater than 30 correspond to obesity.

Like many methods, BMI has limitations. Alone, BMI numbers may not be representative of health risks for certain populations. For example, a muscular athlete may have so much muscle weight due to the density of his or her muscle that his or her BMI will be high. As previously discussed above, a “normal” weight, sedentary individual may have little muscle weight, a low BMI and still be over-fat.

What is energy balance?

What factors are important in maintaining energy balance?

What factors are important in weight loss and maintenance?



In order to maintain a particular body weight, one must maintain energy balance, which means spending all of the calories one eats over a given time period. During a twenty-four hour period, if fewer calories are eaten than are used, an energy deficit is created and weight is lost. Should weight loss be a goal, it is preferable that most of the loss be in body fat and not in fat-free mass (loss of muscle tissue would result in lowered metabolic rate). The healthiest and safest way to ensure this outcome is to reduce calories moderately while maintaining a sound nutrition program. It is also important to exercise and generally increase physical activity level.

Few people are aware of how much time they spend seated or sedentary during waking hours. Overall activity level plays an important role in maintaining a healthy body composition. Too frequently we skip meals, overeat or graze. We are unaware of portion sizes or the calories contained in the foods we eat. Important tools in weight loss and maintenance are avoiding hunger, determining portion size, maintaining calorie control, and keeping track of daily activity.

Hunger is a basic drive. Like any other animal, we are driven to eat when we are hungry. We will thus seek food in order to satisfy the hunger, without necessarily making healthy food choices. Hunger is strongest when we haven't eaten for a number of hours; the stomach is empty and blood levels of energy-yielding nutrients are low. This is especially true of blood glucose levels. After longer periods of time, the body's fuel supplies begin to run low. We tend to both overeat and make unhealthy food choices when hunger has reached this point.

- ✓ Do not skip meals; plan for times when meals will not be available during the course of a busy day; have healthy snacks accessible.
- ✓ Eat smaller, more frequent meals during the course of the day.
- ✓ Include a balance of carbohydrate, healthy fat and protein in all meals.
- ✓ Eat foods that fill—those that have volume, with the greatest amount of water content, fiber, and other nutrients and the least amount of calories.

While it is unrealistic to bring measuring tools along during the course of a work or school day, it is important to be aware of the portion sizes and their associated calorie values for the different foods we eat.

One helpful way of avoiding extra calories is to recognize the portion sizes of different foods or food groups by associating them with common objects.

Common objects and food portion sizes

fruit serving = baseball



3-oz. serving of meat, poultry or fish = deck of cards



1-oz. cheese = pair of dice



medium potato = computer mouse



serving of peanut butter = walnut



serving of grapes or vegetables = light bulb



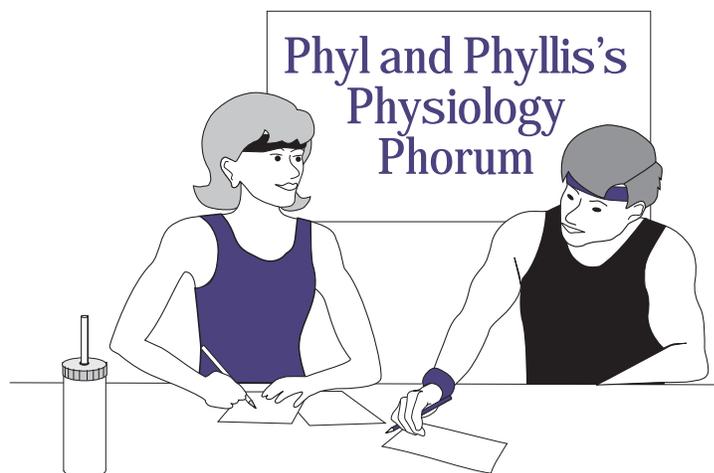
serving of pasta = golf ball



Becoming aware of your daily activity level is another way to observe and assess the healthiness of your lifestyle. Many of us spend countless hours sitting—behind desks working on computers, watching television, and eating meals. Getting up and moving often during the course of a day energizes us while it adds energy expenditure. There are numerous ways to spend energy and time other than seated.

What are the USDA Dietary Guidelines?

As with the American Dietetic and American Diabetes Association's Exchange system, the current United States Department of Agriculture's (USDA) Dietary Guidelines and accompanying Food Guide Pyramid provide a user-friendly food guidance system.



Among other valuable information, the guidelines offer suggestions for maintaining or achieving healthy body weight. Additionally, they provide key recommendations for calorie requirements, food groups, portion sizes, macronutrient balance, and weight management. They also address some of the important nutrient needs of special populations.

The guidelines encourage variety and nutrient density in the diet. Variety refers to the inclusion of several different kinds of foods, including vegetables, fruits, whole grains, lean meats or meat substitutes, healthy fat, and low-fat dairy food sources. Nutrient-dense foods are those that provide as many nutrients as possible within a given food portion. They also support meeting appropriate energy needs for activity level and lifestyle.



USDA Guidelines General Recommendations

Choose a wide variety of fiber-rich fruits and vegetables.

Eat 2 cups of fruit and 2.5 cups of vegetables per day for a 2,000 calorie diet.

Include dark green, orange, and colorful vegetables.
Consume less than 10% of calories from saturated fatty acids; consume less than 300 mg of cholesterol.

Keep total fat intake between 20 and 35%, coming mostly from sources of poly-unsaturated and mono-unsaturated fatty acids such as fish, nuts, and vegetable oils.

Limit intake of fats and oils high in saturated and/or trans-fatty acids.

Consume less than 2,300 mg of sodium per day.

Limit alcohol consumption to 1 drink per day for women and 2 drinks per day for men.

USDA Key Recommendations

- To maintain body weight in a healthy range, balance calories from food and beverages with calories expended.
- To prevent gradual weight gain over time, make small decreases in food and beverage calories and increase physical activity.

For Specific Populations or Groups

- **Those who need to lose weight**
Aim for a slow, steady weight loss by decreasing calorie intake and increasing physical activity.
- **Overweight children**
Reduce the rate of body weight gain while allowing for growth and development. Consult a healthcare provider before placing a child on a weight-reducing diet.
- **Pregnant women**
Ensure appropriate weight gain as specified by a health care provider.
- **Breastfeeding women**
Moderate weight reduction is safe and does not compromise weight gain of a nursing infant.
- **Overweight adults and children with chronic diseases who may need medication**
Consult a healthcare provider about weight-loss strategies prior to starting a weight-reduction program to ensure appropriate management of other health conditions.

USDA Guidelines Estimated Calorie Requirements for Varying Lifestyles

AGE	*LIFESTYLE:	1. Sedentary	2. Moderately Active	3. Active
Males				
4-8		1400	1400 -1600	1600 - 2000
9-13		1800	1800 - 2200	2000 - 2600
14-18		2200	2400 - 2800	2800 - 3200
19-30		2400	2600 - 2800	3000
31-50		2200	2400 - 2600	2800 - 3000
51+		2000	2200 - 2400	2400 - 2800
Females				
4-8		1200	1400 - 1600	1400 - 1800
9-13		1600	1600 - 2000	1800 - 2200
14-18		1800	2000	2400
19-30		2000	2000 - 2200	2400
31-50		1800	2000	2200
51+		1600	1800	2000 - 2200

*Lifestyle Descriptions

1. Sedentary describes a lifestyle that includes tasks of daily living without additional activity.

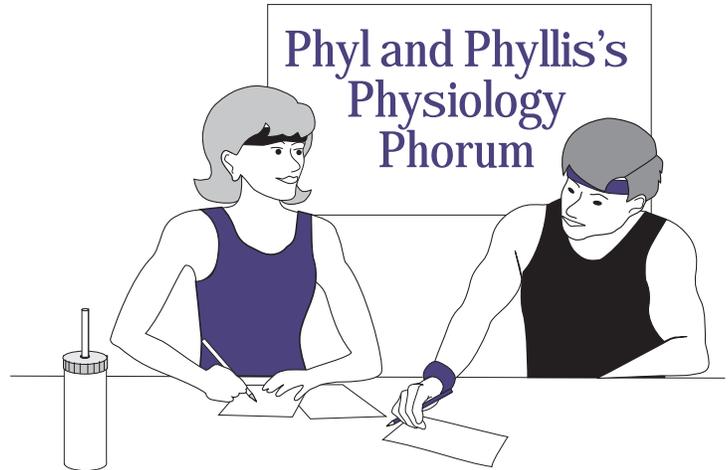
2. Moderately active describes a lifestyle with activity such as walking 1.5-3.0 miles per day at 3.0 to 4.0 mph in addition to performing tasks of daily living.

3. Active describes a lifestyle with activity that includes walking more than three miles per day at 3.0 to 4.0 mph in addition to performing tasks of daily living.

The USDA Food Guide Pyramid is the product of a great deal of research, careful analysis, and interpretation of several food guidance systems. Each detail of the pyramid has a meaningful message. Each of the food groups is color-coded. Grains are coded as orange, vegetables as green, fruits as red, milks as blue, meats and beans as purple, and fats and oils as yellow. The recommended proportions of each food group are designated by the relative width of each colored band. The inclusion of physical activity recommendations, represented by a figure ascending stairs, is a new addition. The interactive web site at www.mypyramid.gov provides an abundance of user-friendly information and printable pages.

What is an energy deficit?

How is an energy deficit accomplished for healthy weight loss?

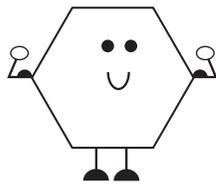


In order to lose body weight, an energy deficit must be created. This can be accomplished by increasing activity level and therefore increasing caloric expenditure and by moderately reducing caloric intake.

While caloric intake must be modified, it is important to eat enough calories in proper macronutrient proportions for optimal nervous system functioning. This will prevent significant loss of muscle mass. Without adequate intake of carbohydrates, the brain and nerves are deprived of glucose, their primary fuel source. As a result, metabolically active muscle tissue is broken down into component amino acids. Amino acids are converted in the liver to glucose. This process, called gluconeogenesis, helps maintain normal blood glucose levels at the expense of fat-free mass and metabolic rate.

USDA Acceptable Macronutrient Distribution Ranges

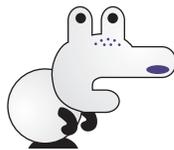
MACRONUTRIENT	RANGE
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carbohydrate.....45% to 65%



fat20% to 35%



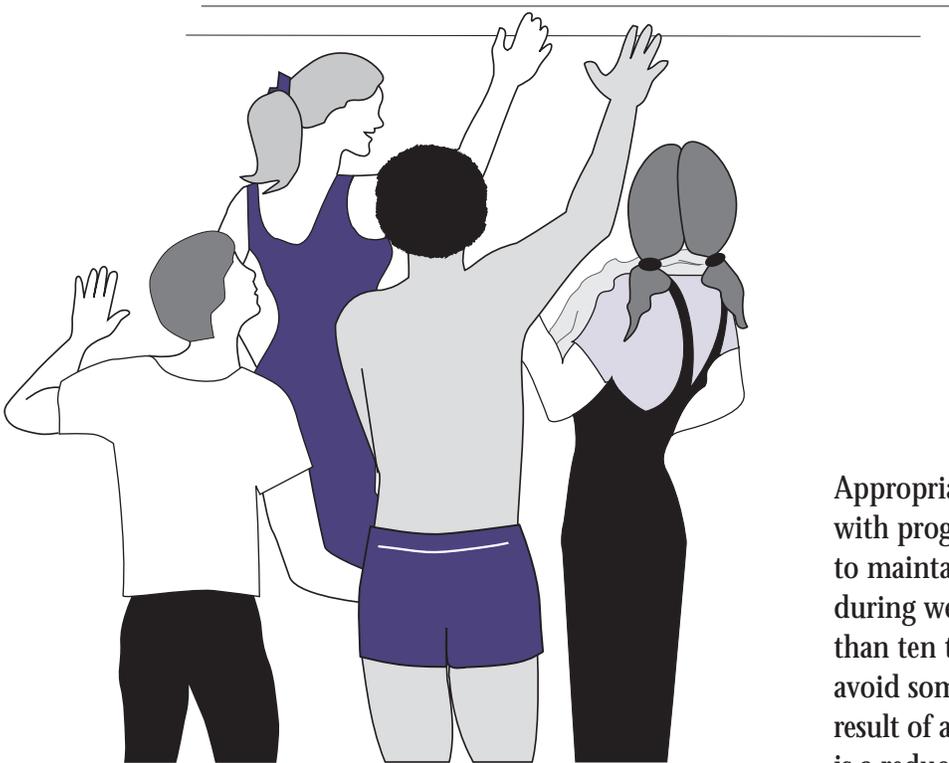
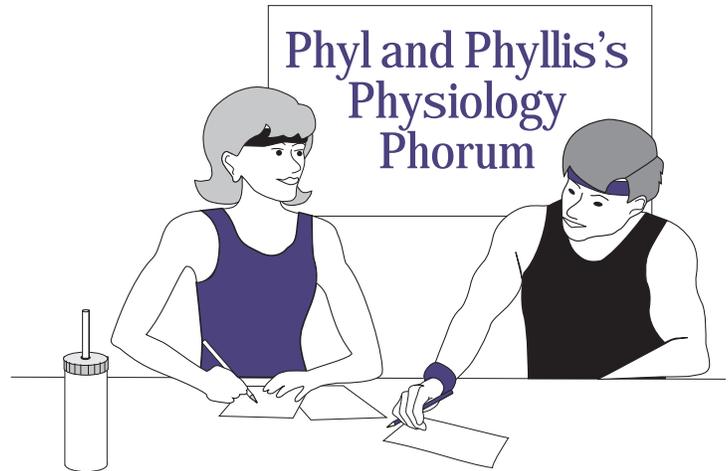
protein.....10% to 35%

A good part of an energy deficit should be created through increased physical activity and exercise. Exercise programs should combine cardiovascular exercise with progressive resistance training. The exercise program helps to utilize and potentially diminish fat stores. The progressive resistance training also helps to maintain muscle mass.

If an individual is already participating in a cardiovascular program, the program should be modified to create larger calorie deficit. The frequency, duration, and intensity of training can all be adjusted to increase calorie expenditure. Introducing new types of activities, cross training, or interval training (adding frequent one- to two-minute increments of higher intensity work) can be an enjoyable and effective way to use more calories.

What is progressive resistance training?

Why should it be added to the exercise program during weight loss?



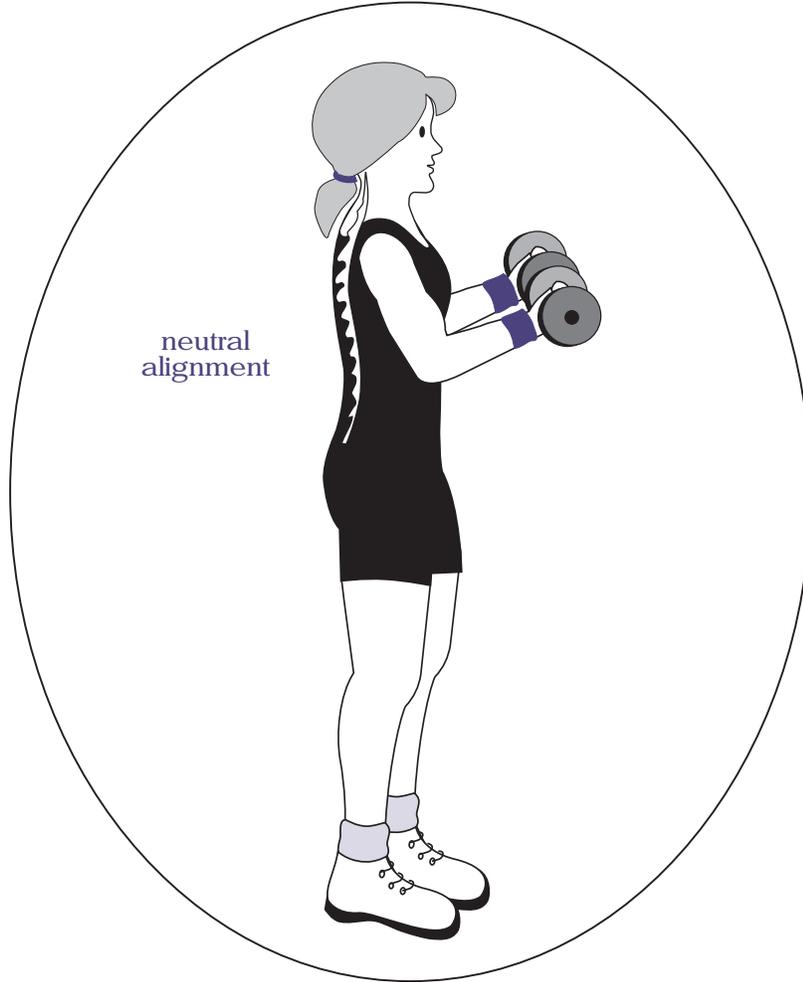
Appropriate calorie consumption combined with progressive resistance training will help to maintain or minimize loss of muscle mass during weight loss. With weight loss of more than ten to fifteen pounds, it is difficult to avoid some loss of muscle mass. The desired result of a good weight management program is a reduction primarily of fat. This results in improved body composition.

Progressive resistance training is an exercise program that results in greater muscular strength and endurance. It is a program in which the intensity and the volume of exercise are increased gradually over time. Intensity is increased with heavier loads, and volume is increased with more exercise or repetitions.

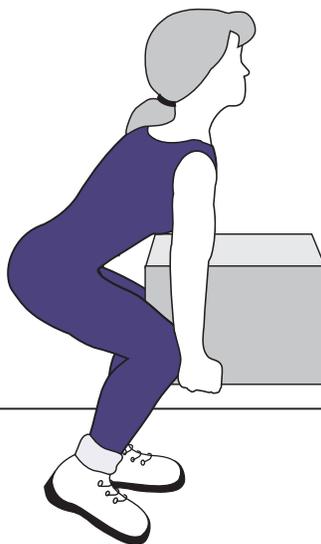
Progressive Resistance Training Checklist

- ✓ Consult a physician before participating in a progressive resistance exercise program to address any diseases or physical limitations.
- ✓ Seek guidance from qualified fitness professionals certified through national or international accredited certifying agencies. This is particularly important should the program require modification due to physical limitations or disease.
- ✓ Maintain neutral body alignment while performing all exercises.
- ✓ Keep the trunk stable; the shoulder blades are held down and back; the belly is held in tightly toward spine.
- ✓ Perform approximately eight to twelve, up to fifteen, repetitions of each exercise for all major muscle groups.
- ✓ Move muscles or muscle groups in a slow, controlled manner, moving through a full range of motion to complete muscle fatigue.
- ✓ Count two seconds on the lifting (effort) phase and four seconds on the lowering phase of each repetition of an exercise.
- ✓ Exhale on the effort phase and inhale on the lowering phase of each repetition of an exercise.
- ✓ Progress gradually; increase the resistance approximately five percent after being able to perform 12 repetitions of an exercise easily.
- ✓ Perform the necessary static stretches following the program to return muscles to their neutral resting length.
- ✓ Hold static stretches gently for 15 to 30 seconds.
- ✓ Pay close attention to areas of chronic tightness. These areas often include the muscles of the calves, front and back of the hip, the back of the thigh (hamstrings), the lower back, the chest, and the front of the shoulder. Perform multiple repetitions for these areas.

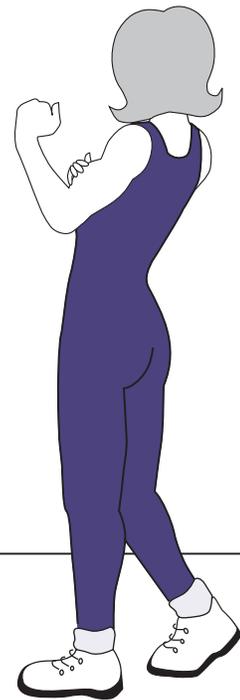
Progressive Resistance Training



muscular endurance



muscular strength

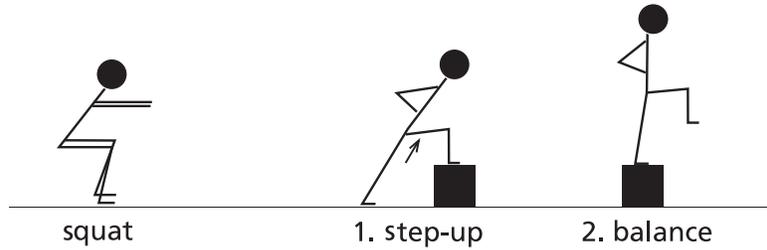


muscular hypertrophy

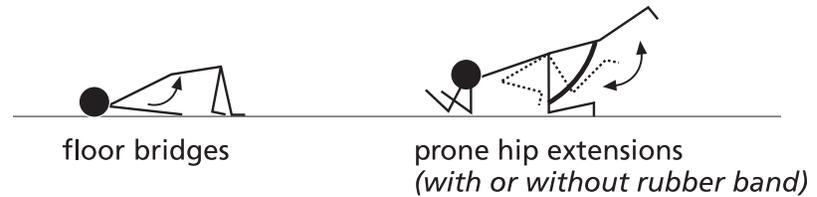
Basic Exercises: Sample Lower Body Program

Choose one exercise for each muscle group. Perform 8 to 12, up to 15 repetitions, per set.

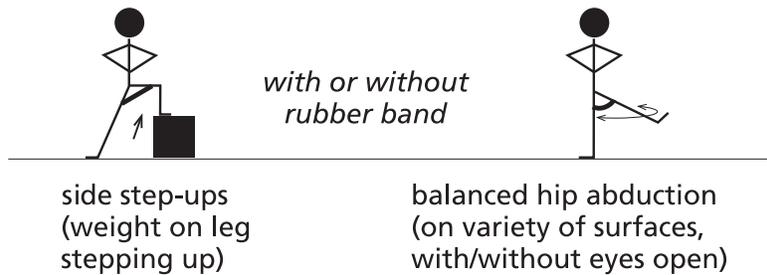
1. HIPS AND FRONT OF THIGH (Quadriceps)



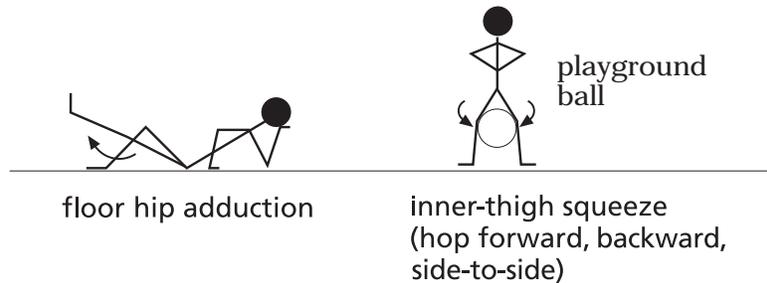
2. GLUTEALS AND BACK OF THIGH (Hamstrings)



3. HIP ABDUCTORS AND THIGHS

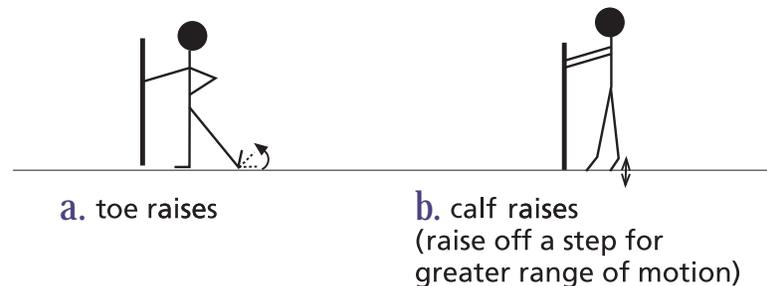


4. HIP ADDUCTORS AND THIGHS



5. CALVES

a. Front of calf
b. Back of calf



Resistance materials used in the program may include free weights, rubber, cable systems, machines, or simply body weight opposing gravity. Muscles must move resistances or loads that they are not used to moving. They must be overloaded. The program must be changed periodically so that the muscles do not accommodate to the exercises. Muscles that become used to exercises are no longer stimulated to change. Programs must be personalized, based on individual needs. They also must be modified to meet an individual's limitations.

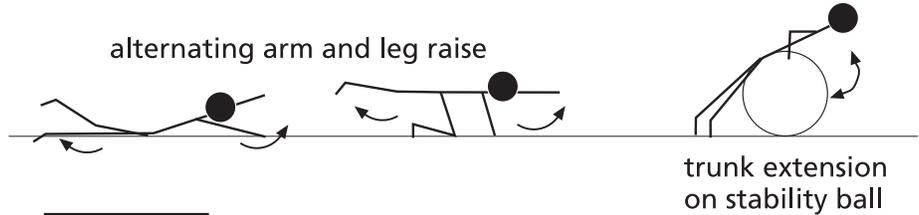
Basic Exercises: Sample Upper Body/Trunk Program

Choose one exercise for each muscle group. Perform 8 to 12, up to 15 repetitions, per set.

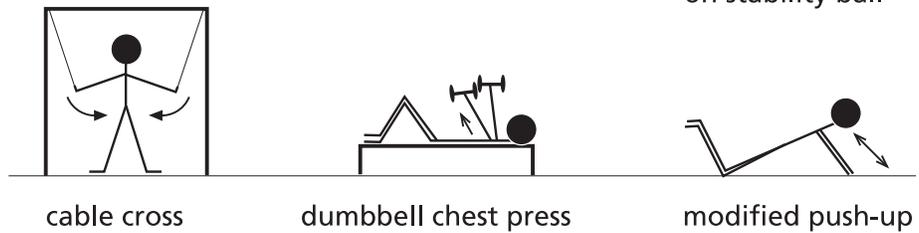
1. ABDOMINAL (Trunk Flexors)



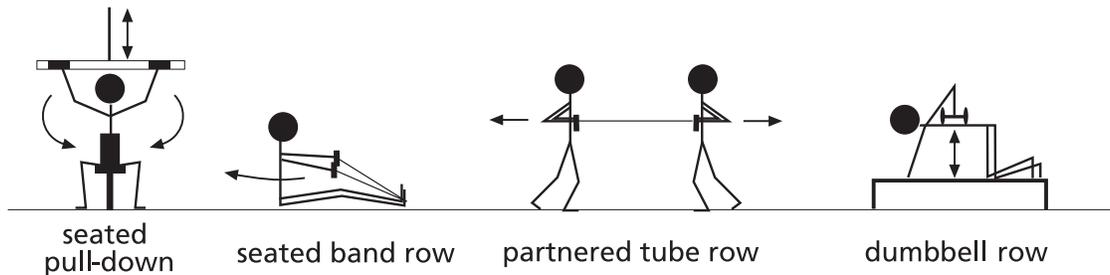
2. BACK (Trunk Extensors)



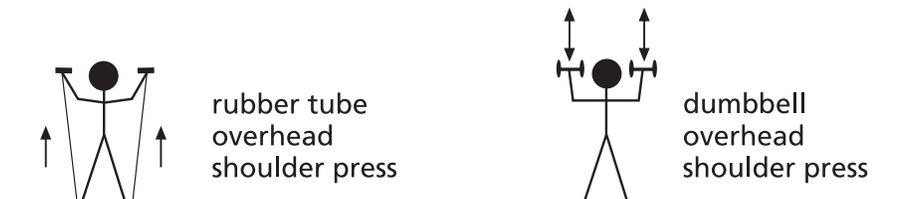
3. CHEST



4. UPPER AND MIDDLE BACK



5. SHOULDERS

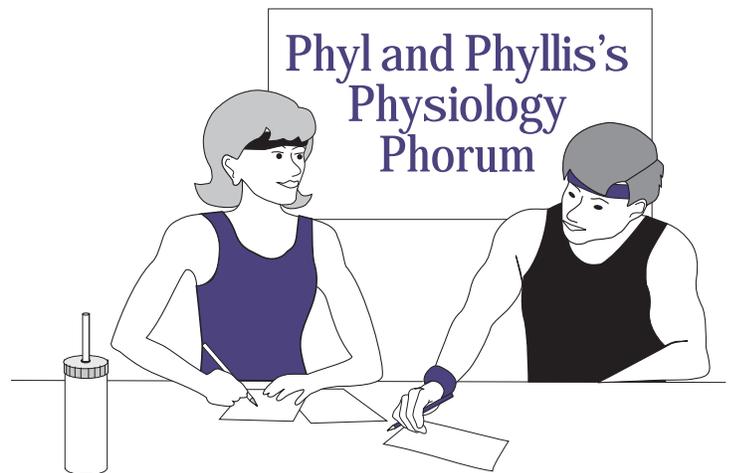


6. ELBOW FLEXORS



7. ELBOW EXTENSORS





The ACSM and ACE recommendation of a minimum of two sessions per week should include one to three sets of ten to twelve exercises that utilize all of the major muscle groups. The major muscle groups to be included are the chest, upper and lower back, abdominal muscles, the front and back of the arms and legs, and the buttocks. Exercises should be performed in proper neutral body alignment under proper supervision, moving muscles through their full range of motion in a slow, controlled manner. Proper breathing technique should be used; exhaling on the effort phase and inhaling on the lengthening phase of each exercise. Breath holding should be avoided.

In strength training, loads should be sufficient to approach momentary fatigue in the muscle or muscle groups while performing eight to twelve repetitions of an exercise. Initially, strength gains are the result of better neurological functioning. Later, strength gains are additionally the result of an increase in the density of muscle fibers. This is called muscular hypertrophy.

To achieve better muscular endurance, more repetitions are performed with less resistance. Muscles exercised

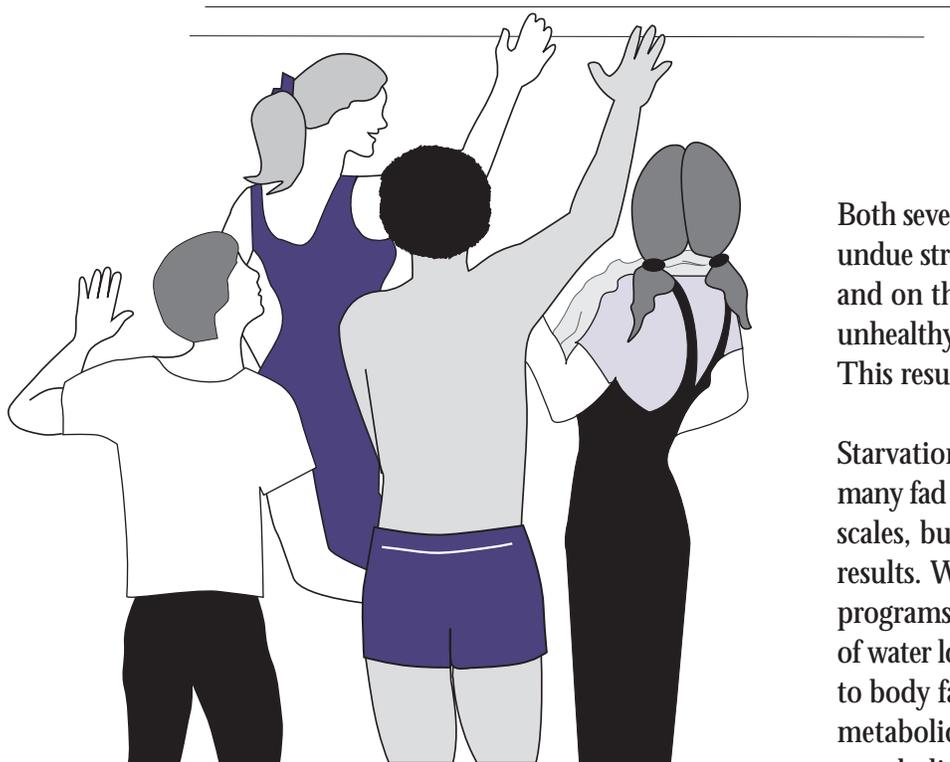
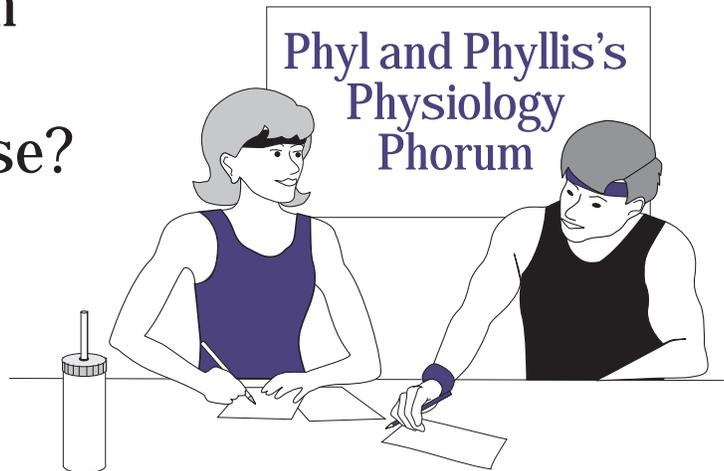
for endurance become better equipped to handle tasks of daily living for longer periods of time with less effort. Carrying groceries, briefcases, backpacks, babies, or golf clubs becomes easier.

Strength training stimulates greater muscle protein synthesis as a result of the stress imposed on the existing muscle tissue. The body makes what it needs to handle the work it is going to perform on a regular basis. A day of strength training should be followed by a day of rest for the muscles that were exercised so that they have time and energy to synthesize the additional muscle protein. Protein synthesis in itself utilizes energy. The increase in the muscle mass coupled with the energy cost of building new muscle increases the metabolic rate.

Not only does a progressive resistance program potentially increase the density of muscle, but it can also increase the tissue density in bones, ligaments, and tendons. Strong bones and musculature help to maintain good posture and balance. Strong musculature also helps to keep joints stable and free of injury.

How much of an energy deficit should be created through dietary modification?

How much through exercise?

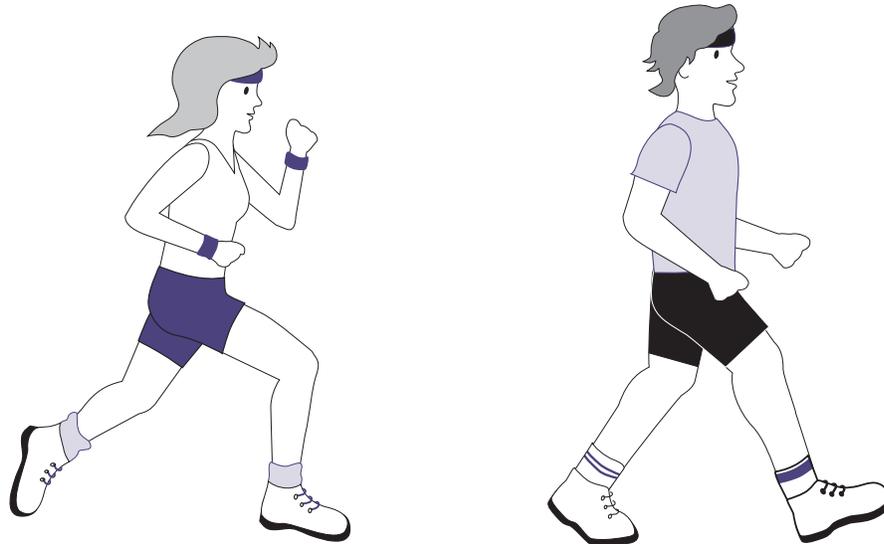


Both severe obesity and excessive thinness place undue stress on healthy vital organ functioning and on the musculoskeletal system. Both unhealthy body compositions promote disease. This results in diminished quality of life.

Starvation diets, very low-calorie diets, and many fad diets produce fast results on bathroom scales, but do not produce healthy, lasting results. Weight loss resulting from these programs is often the result of a combination of water loss and loss of fat-free mass as opposed to body fat. Loss of fat-free mass means loss of metabolically active tissue and lowered metabolic rate.

Additionally, low calorie often corresponds to low energy. A fatigued individual is not typically enthusiastic about exercise. The desired body weight should be one that is realistic, attainable, and coincides with a healthier body composition. It should also be one that corresponds to frame size. Larger bones and larger musculature weigh more.

Simple Means to Achieve 1,000 Calories in Cardiovascular Exercise



- 15- to 20-minute jog or a 20- to 25-minute brisk walk daily
- 20- to 25-minute jog or 30- to 35-minute brisk walk 5 days per week
- 35- to 40-minute jog or 50- to 60-minute brisk walk 3 days per week

It takes an energy deficit of 3,500 calories to lose one pound of fat. If we avoid skipping meals, we can avoid the resulting hunger and overeating. If we also eliminate unconscious snacking and pay attention to portion sizes, it is reasonable to create an energy deficit of 500 calories per day. This would create a 3,500 calorie deficit per week and potentially a one-pound weight loss.

For the sedentary individual, it is also reasonable to begin a cardiovascular exercise program of 1,000 calories per week to add to the energy deficit. The 1,000 calories can be divided into seven, five, or three days, depending on individual time constraints. A daily accumulation of sixty or more minutes (over multiple bouts of cardiovascular exercise if necessary) is frequently recommended to help individuals create a greater calorie deficit. Gradually, the duration and intensity of the cardiovascular exercise should be increased.

For the person who already exercises and uses a particular number of calories per week in cardiovascular exercise, additional calories can be expended by adding new types of exercise or by adjusting the frequency, duration, or intensity of their current activities. An additional 500 to 1,000 calories of exercise can be added if necessary. Barring a medical issue or metabolic disorder, someone who is already exercising regularly is not excessively over-fat. Some individuals may only want to improve their body composition, lose some fat, or become more fit and healthy.

Small increases in exercise and activity add up quickly. For instance, ten extra minutes per exercise session can create at least 500 additional calories per week. Adding extra daily activities such as pacing, using stairs instead of elevators or escalators, and walking to and from restaurants, stores and train stations can also contribute to greater calorie expenditure.

Combined, the energy deficit created from calorie and portion control plus the energy expended in the cardiovascular and other physical activity accumulate to a weight loss of about one to two pounds per week. Though many people desire more rapid results, this is a safe rate of loss in which loss of FFM is minimized and fat will be lost.

Fat is lost when one uses more fat than that which is deposited. We cannot determine or choose areas of fat to be lost. Muscles do not use the fat that surrounds them. Fat is released from storage when epinephrine stimulates an enzyme in fat tissue. This stimulation along with other factors causes fat to be released into the blood and become available to cells to fuel their work.

Some people carry more fat in their abdominal areas, some in their hips and thighs. For better or worse, our heredity and many other factors dictate where we deposit fat. The same is true for where we release fat.

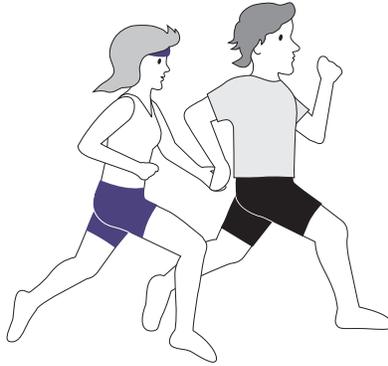
Cardiovascular exercise causes the adrenal gland to produce epinephrine, resulting in the release of fat from fat storage. When aerobically-trained muscle cells perform activities, their more numerous mitochondria allow for greater oxygen utilization. The greater the use of oxygen, the more released fat is used.

A good weight-management program is one that combines moderate caloric reduction with a sound nutritional program. Combining a healthy, balanced diet with a regular exercise program and a general increase in activity level is a healthy way to manage weight. The emphasis should be on achieving a healthy body composition while maintaining one's metabolic rate.

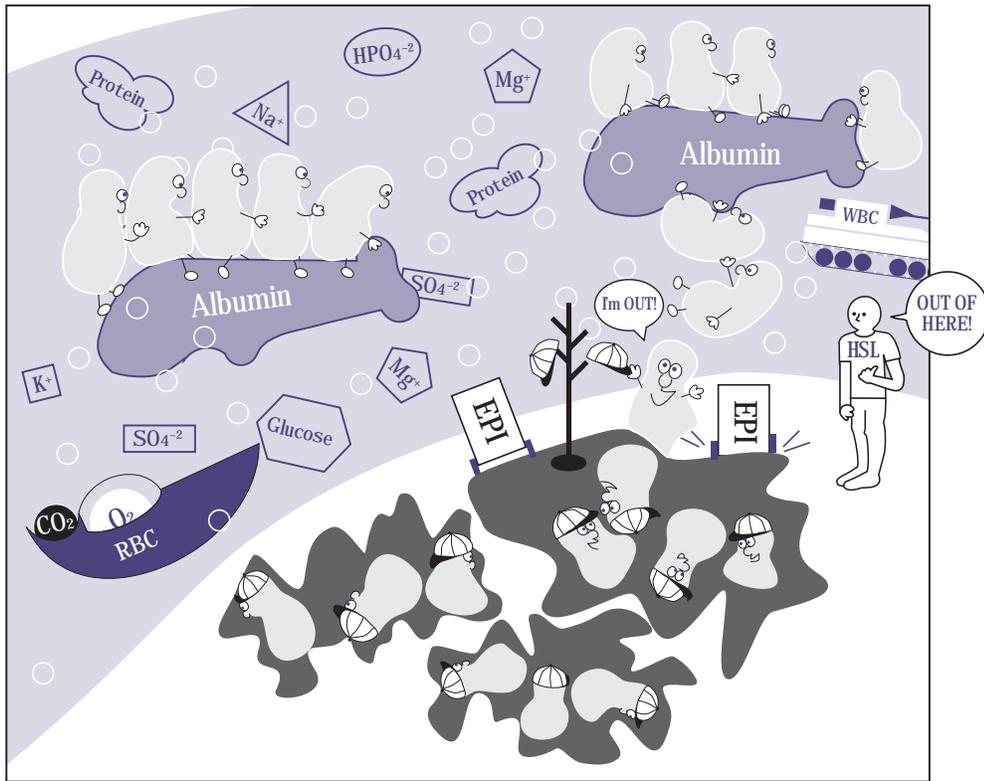
The exercise program should include both cardiovascular exercise and progressive resistance training. Moderately challenging cardiovascular exercise will help gradually use fat storage. Progressive resistance training helps to maintain muscle mass, bone density, and therefore metabolic rate.

Weight goals should be realistic, attainable, and consistent with one's age and heredity. They also should be reached over a reasonable period of time. Quick weight loss is tempting but is not typically associated with healthy methods. Active pursuit of goals through good habits over the long term will achieve a body composition that reflects healthier physiology.

Good Weight-Management Program



1 use fat through increased activity + ...

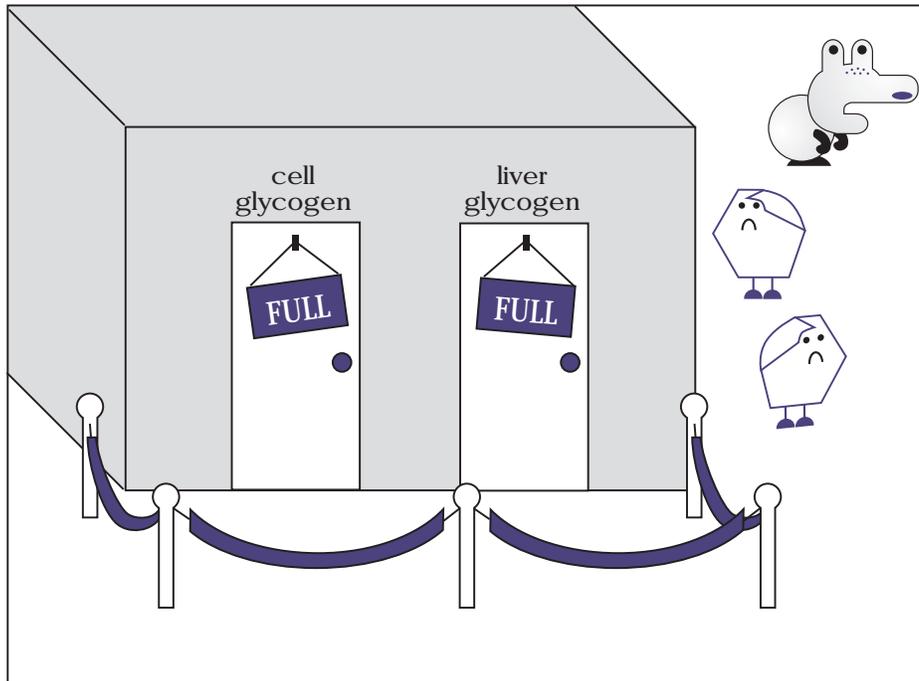


2 maintain muscle mass + ...

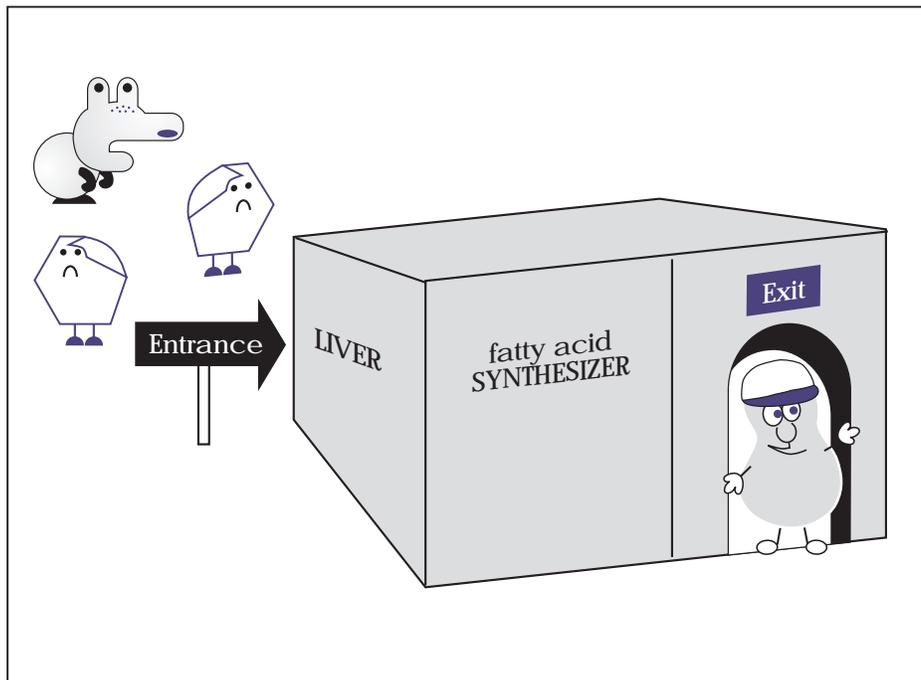


Good Weight-Management Program

3 avoid consuming excess calories + ...

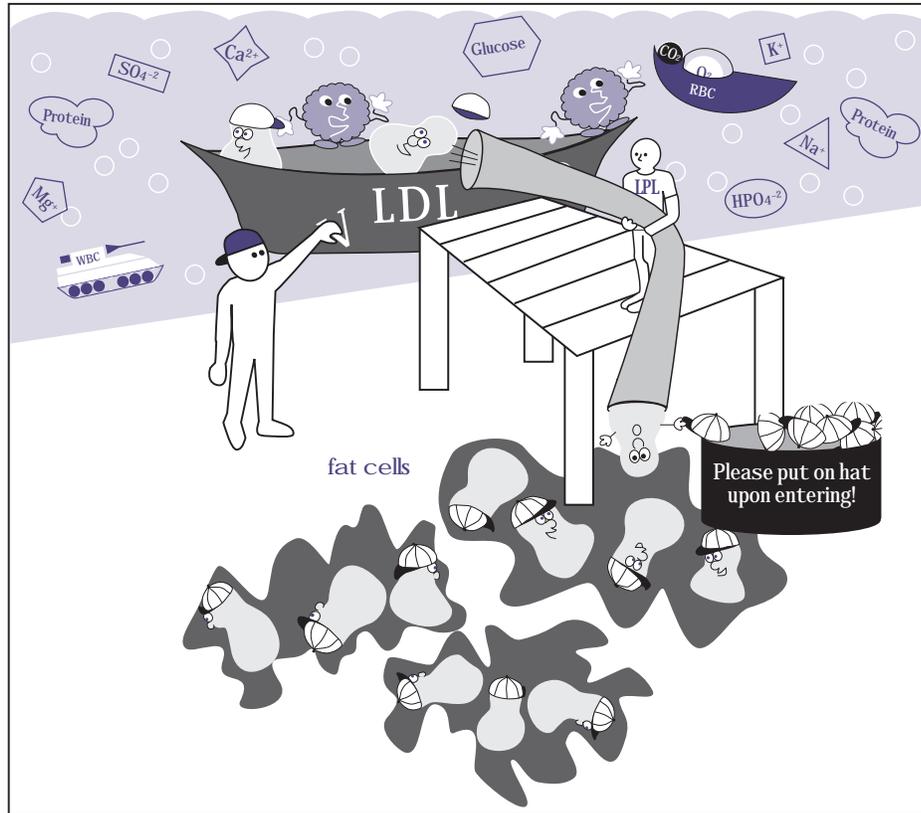


4 results in making less fat + ...



Good Weight-Management Program

5 less fat deposited + ...



= body composition improvement